

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES**

In re the Application of:

Conf. No. 2397

Koji YAMADA et al.

Art Unit: 1793

Application No.: 10/521,818

Examiner: Yang, J.

Filed: January 21, 2005

Attorney Dkt. No.: 12065-0020

For: METHOD AND APPARATUS FOR RECOVERING PLATINUM GROUP ELEMENTS

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This appeal is filed based on the final rejection dated August 21, 2009 of claims 1, 3 and 4. A Notice of Appeal was filed on January 21, 2010.

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I. REAL PARTY IN INTEREST

The real party in interest in the application is Dowa Metals and Mining Co., Ltd., Tanaka Kikinzoku Kogyo K.K., Kosaka Smelting & Refining Co., Ltd., and Nippon PGM Co., Ltd. (hereinafter the "Appellant").

II. STATEMENT OF RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings known to Appellant or Appellant's legal representative that may be related to, directly affect, be directly affected by, or have a bearing on the Board of Patent Appeals and Interferences' (hereinafter the "Board") decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1 and 4 stand finally rejected under 35 U.S.C. § 103(a) as unpatentable over under 35 U.S.C. § 103(a) based on the combination of United States Patent No. 5,252,305 to Ezawa et al. (US '305) when combined with JP 2000 248322 to Yamada (JP '322) and United States Patent No. 6,699,302 to Jones et al. (US '302). Claim 3 is also rejected under 35 U.S.C. § 103(a) as unpatentable based on the combination of US '305, JP '322, US '302, and United States Patent No. 5,735,933 to Yokoyama et al. (US '933). Claims 2 and 5-7 are canceled. The full text of claims 1, 3, and 4 may be found in the Claims Appendix. Claims 1, 3, and 4 are the subject of this appeal.

IV. STATUS OF AMENDMENTS

All amendments are entered for purposes of this appeal.

V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention relates to a method for recovering platinum group elements. Independent claim 1 defines a method that involves the steps of charging into a closed electric furnace and melting, together with flux components and a reducing agent, a platinum group element-containing substance including spent petrochemical type catalyst or spent vehicle exhaust gas purification catalyst to be processed and a copper source material containing copper oxide, see paragraphs [0020 and 0034] and Figure 1 of Appellant's published application. All further references to paragraph nos. refer to Appellant's published application.

When the charged material melts down, molten metal of primarily metallic copper sinks below a molten slag layer of primarily oxides; and the platinum group elements are enriched in the molten metal sunk below, see paragraphs [0022, 0035, and 0036].

The copper source material charged into the electric furnace is composed of granules of an average grain diameter of not less than 0.1 mm and not greater than 10 mm, see paragraph [0030]. The control of the average grain diameter of the granules is important for the "copper showering effect" described in paragraph [0036]. This effect is able to be achieved by the control of the size of the copper source material. As explained in paragraph [0036], if the size of the copper source material is too small, i.e., less than 0.1 mm, it takes a long time to sink through the slag and the taking up of the platinum group metals by the molten metal copper is reduced. If the copper source material is too

big, i.e., greater than 10 mm, the molten copper sinks too quickly and the taking up of the platinum group metals is reduced.

Another critical aspect of the invention is the ascertaining of the copper content of molten slag in the furnace for purposes of deciding when to discharge the slag from the furnace. The ascertaining is done by sampling and analyzing, see paragraph [0027].

The discharge of the molten slag from the electric furnace occurs when a copper content of the molten slag determined by the ascertaining step is 3.0 wt.% or less.

The control of the discharge based on the copper content of the molten slag results in enhanced recovery of the platinum group metals. What Appellant has discovered is that the amount of platinum group elements remaining in the slag is closely related to the amount of copper remaining in the slag. This is explained in paragraph [0026] and illustrated in Figure 2. Then the copper content in the slag is 1 wt.% for example, the Pt, Pd, and Rh contents in the slag are very low, and with a further decline in the copper content in the slag, the platinum group elements are even lower. When the Cu content of the slag exceeds 3.0 wt.%, the contents of platinum group metals such as Pt, Pd, and Rh in the slag increase sharply and the recovery rate of the platinum group metals decreases rapidly.

Claim 3 further limits the method of claim 1 by specifying that the interior of the electric furnace is maintained at a pressure lower than atmospheric pressure from the melting of the charge material to the discharging of the molten slag, see paragraph [0021]. Figure 1 shows an exhaust port 5 and an exhaust unit 9, which cooperate to maintain the lower than atmospheric pressure from the melting to discharging steps.

Independent claim 4 shares the steps of charging into a closed electric furnace and melting, together with flux components and a reducing agent, a platinum group element-containing substance to be processed and a copper source material containing copper oxide, sinking molten metal of primarily metallic copper below a molten slag layer of primarily oxides, and enriching the platinum group elements in the molten metal sunk below to form a molten metal enriched in the platinum group elements with claim 1.

Independent claim 4 also shares the control of the size of the granules and the manner in how the slag is discharged based on copper content of the slag with claim 1.

Independent claim 4 differs from claim 1 by including the step of separating the molten metal enriched in the platinum group elements from the molten slag and transferring the molten metal to a separate furnace while still in the molten state, see paragraph [0039].

The transferred molten metal is oxidized in the separate furnace to separate it into a slag layer of primarily oxides and a molten metal layer further enriched in the platinum group elements, see paragraph [0040].

The molten slag generated in the separate furnace is water-cooled from a high-temperature state to obtain the copper source material containing the aforesaid copper oxide composed of granules having a grain diameter of not less than 0.1 mm and not greater than 10 mm, see paragraph [0042].

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant seeks review of the rejection of claims 1, 3, and 4 under 35 U.S.C. § 103(a) based on US '305, JP '322, and US '302. All claims are argued separately for patentability.

VII. ARGUMENT

A. Introduction

This appeal addresses a number of errors committed by the Examiner in rejecting claims 1, 3, and 4. However, one fundamental issue of patentability involves the question of whether the prior art teaches or suggests when to discharge the slag from the furnace as part of the process of recovering PGMs using a copper metal. It is important to understand that one main aspect of the invention is determining when to terminate the smelting operation and discharge the slag from the furnace. Discharging the slag at the proper time means that the smelting process becomes highly efficient. Appellant is not claiming to be the first to make a determination as to when the slag should be discharged since the prior art uses a number of different techniques that monitor different parameters to decide the ending time of a smelting operation.

The employment of the inventive technique of ascertaining and analyzing the copper content of the slag in the furnace and basing the time of discharge of the slag from the furnace on a target copper content of 3.0% or less means that the inefficiencies of the smelting process by discharging too soon or too late are avoided. The importance of discharging at the proper time can be seen from Figure 2 of the instant application. Too early of a discharge brings a lower recovery rate of PGMs. Too late of a discharge means that the energy costs for the smelting operation are too high. Thus, it is vital to discharge the slag at the proper time. This is one aspect of what the invention does and is not what is found in the teachings of the applied prior art, especially the secondary references JP '322 and US '302 as is alleged to be the case by the Examiner.

Appellant is arguing in one aspect that they are the first to base the discharging of the slag on the ascertaining and analyzing of copper content of the slag in the furnace and discharging the slag when the copper content is 3.0% or less in the slag.

An underlying argument throughout this Appeal Brief is that the Examiner has improperly interpreted the teachings of the prior art to support the allegation of obviousness. While the Examiner is tasked with interpreting the prior art as part of the examination duties assigned by the U.S. Patent and Trademark Office, this interpretation is in the context of the meaning of the prior art to those of skill in the art. *In re Berg*, 320 F.3d 1310 (Fed. Cir. 2003) ("As persons of scientific competence in the fields in which they work, examiners and administrative patent judges on the Board are responsible for making findings, informed by their scientific knowledge, as to the meaning of prior art references to persons of ordinary skill in the art and the motivation those references would provide to such persons.") As will be argued below, the properly-interpreted facts as they relate to the teachings of the cited prior art do not support the conclusions of obviousness.

Appellant is also taking issue with the reasoning used to reject claims 3 and 4 and the failure to consider the evidence in the specification regarding the importance of the size of the copper source material.

B. Rejection of Claim 1 under 35 U.S.C. § 103(a) Based on US '305, JP '322, and US '302.

1) Introduction.

In the final rejection of August 21, 2009, the Examiner refers to the previous rejections of November 28, 2007, June 5, 2008, and November 25, 2008 for the rejection details. There is no November 25, 2008 rejection and Appellant assumes that the Examiner is referring to the rejection dated December 22, 2008.

The rejection can be summarized as follows:

- i) US '305 teaches the charging, sinking, and enriching steps of claim 1;
- ii) US '305 teaches that the slag is discharged from the furnace;
- iii) US '305 does not teach that the copper content of molten slag has decreased to 3.0 wt. % when discharged;
- iv) the copper content of the slag is a result-effective variable as evidenced by JP '322;
- v) JP '322 shows the relationship between copper content of the molten slag and the recovery rate of Pt and because of this, one of skill in the art would have found it obvious to optimize the result-effective variable of copper content in the molten slag and discharge the slag when the copper content has decreased to 3.0 wt%;
- vi) the average grain diameter of the copper source material is recognized as a result-effective variable;
- vii) US '305 teaches using crushed materials containing platinum group metals that have a diameter of not more than 5 mm to obtain high recovery rates of Pt, Pd, and Rh;

viii) it would be obvious to one of skill in the art to control the grain diameter in the process of JP '305 such that the size of the source copper would be not less than 0.1 mm and not more than 10 mm;

ix) the modified process of US '305 does not teach the step of analyzing and ascertaining the copper content of the slag to determine when to discharge the slag from the furnace; and

x) US '302 teaches a PGM recovery process that uses an electric furnace and is one that analyzes the original concentrate, the roasted concentrate, and the slag, see the rejection of June 5, 2008.

With respect to item (x), the Examiner takes the position "It would have been obvious to one of skilled in the art to apply the slag analysis and monitoring process of US '302 in the process of US '305 in view of JP '322, because US '302 teaches high recovery of the precious metals (99.0%) could be obtained (Col. 19, line 28 to Col. 20, line 53 of US '302."

2. The Examiner has committed error in rejecting claim 1 by misinterpreting the teachings of US '302.

A key aspect of the Examiner's rejection is the reliance of US '302 to allege that US '302 analyzes the copper content of a slag in a PGM recovery process and this copper content is less than the claimed 3.0%.

In the final rejection of August 21, 2009, the Examiner asserts that US '302 teaches a copper content of 0.36% in the slag to obtain a recovery rate of 99.0% PGMs, citing col. 20, lines 24-53. The Examiner notes that this 0.36% value is within the claimed range of less than 3.0% and concludes "The method of sampling and

analyzing of slag would be obvious to one of skill in the art and the Appellant has not provided any unexpected results over the prior arts in the record.”, see page 4 of the August 21, 2009 final rejection.

The Examiner’s calculation of a copper content of 0.36% is based on an interpretation that the value of 5.55 derived from the Table in col. 20 of US ‘302 means 5.55 grams.

Appellant contends that interpreting the value of 5.55 as grams in the Table of col. 20 is an incorrect interpretation of the teachings of US ‘302. This error means that the rejection is not valid since the copper content of the slag of US ‘302 does not overlap the target value of 3.0% or less.

Concerning the crucible test described in col. 20, lines 24-48, US ‘302 states that the crucible test “produced 1517 g of slag, and 38 g of a copper-nickel alloy containing the vast majority of the precious metals”, see col. 20, lines 27-29.

The Table in col. 20 details the compositional breakdown of the furnace matte, roasted matte, first stage alloy, and first stage slag in terms of Cu, Ni, Co, S, Fe, FeO, SiO₂, and PGM. The question here is what are the units of the values listed in the Table. The Examiner looks at the first stage slag line and assumes that the value of 5.55 is grams and since there is 1517 total grams of slag, the copper percentage in the slag is 5.55/1517 or 0.36%. However, if the unit of elements of the first-stage alloy and slag are shown in the Table should be taken as “gram”, the total of the components, of Cu, Ni etc. should amount to 38 g of the copper nickel alloy for the first-stage alloy and to 1517 g for the first-stage slag. However, when closely looking

at the Table, totaling the amounts of Cu, Ni, Co, S, and Fe for the first-stage alloy produces a value of 97.0 (not 38 grams as US '302 states). Totaling the same values for the first-stage slag produces a value of 84.58 (not the 1517 grams stated in US '302).

If the values in the Table were to represent the weight of the slag in grams, it should total to the measured value of 1517 g or at least close thereto. However, the sum of the reported values is only 84.58. Likewise, if 38 g of copper-nickel alloy are produced from the crucible with the 1517 g of slag, the sum of the first stage alloy should total 38 but it totals 97.0. This means that the values of the Table of US '302 are more likely to be reported as a percentage. This percentage interpretation makes more sense since the sum of the values of the first-stage alloy are close to 100%, i.e., 97. While the slag value summation is only roughly 85%, this is likely a result that not all of the slag components were analyzed or reported, thus accounting for a sum of less than 100%.

When interpreting the values of the Table of col. 20 of US '302 to be percentages, the copper content of the slag is 5.55%, which is outside the value of 3.0% or less. This means that even if the Examiner were to use the single copper content value for the slag of US '302, how does the Examiner arrive at the claimed threshold value of 3.0 wt.% or less as an indicator that the slag can be discharged. There is no basis for saying that one would employ a copper content of 3.0 wt.% as a target content for slag discharge when no such value is disclosed in US '302.

Appellant also contends that the single data point of US '302 is insufficient for the Examiner to say that such copper content would be optimized such that the claimed limit is somehow obvious based on US '302. US '302 is completely silent regarding determining the point of slag discharge based on the copper content of the slag and the one data point cannot be used to allege that the claimed target is somehow obvious.

In order to have an optimization based on a result-effective variable, the variable must be recognized, see *In re Yates*, 663 F.2d 1054 (CCPA 1981). In this instance, the mere measurement of the copper content in a slag does not mean that the prior art recognizes that the copper content in connection with the discharge of the slag is a variable that enhances PGM recovery. US '302 says nothing about controlling the copper content of the slag for the purpose of enhancing PGM recovery so that there is no variable to be optimized.

The error in the interpretation of the Table of US '302 mandates withdrawal of the rejection since a proper factual foundation does not exist to support it.

3. The Examiner's reliance on the col. 17 Table and lines 40-48 of US '302 to reject claim 1 is also error.

In the Advisory Action of December 3, 2009, which was in response to Appellant's filing of November 16, 2009, the Examiner appears to admit that the unit for the value of 5.55 used in the Table in col. 20 of US '302 is not clear. Because of this, the Examiner falls back to the Table in col. 17 of US '302 and the Cu percentages of 0.49% and 0.43%. The Examiner cites these percentages as evidence that a copper content of the slag of less than 3.0% is still disclosed in US '302.

The Examiner has committed error in this stance since the Table in col. 17 of US '302 has nothing to do with the copper content of the slag that when practicing the claimed steps of charging, sinking, and enriching to recover PGMs.

US '302 discloses a process for treating a metal sulphide concentrate including intrinsically the steps of (a) roasting the concentrate to reduce the sulphide content of the concentrate, and (b) smelting the roasted concentrate under reducing conditions in an electrically stabilized open-arc furnace, see col. 4, lines 26-32. This process is used for the treatment of nickel, copper, and cobalt sulphides and PGM concentrates, see col. 5, lines 14-16.

The Table in col. 17 that the Examiner uses as a basis for the rejection relates to a test described in col. 16, line 31 to col. 17, line 60. This is a treatment of the former concentrate that is Ni, Cu, Co concentrate that does not contain any PGM. This is clear when closely inspecting the description of the test and the Tables; there is no mention whatsoever of any PGM or recovery thereof. The copper percentage in the slag of 0.49% and 0.43% as detailed in the Table on line 45 of col. 17 relates to the slag obtained when smelting the calcine or dead roasted concentrate. The dead roasted concentrate was made by roasting the Ni, Cu, and Co concentrate to reduce sulphide content, which does not contain PGM.

The process of US '302 as detailed in cols. 16 and 17 is irrelevant to a process of charging, sinking, and enriching for the recovery of PGMs as detailed in claim 1. It says nothing about how to recover PGM efficiently or suggest which parameter should be adopted to determine a slag discharge time to avoid useless operating time. Therefore,

it is error for the Examiner to use the copper content of the slag in the Table in col. 17 of US '302 to allege that US '302 teaches a slag discharge when the copper content of the slag is less than 3%. Again, the Table in col. 17 says nothing about control of the slag discharge based on the copper content of the slag. See *In re Yates*, supra.

What the arguments above mean is that the Examiner has committed error by basing the rejection on an improper interpretation of US '302. This error means that a *prima facie* case of obviousness is not established with respect to claim 1 and the rejection must be reversed.

4. The prior art does not establish a *prima facie* case of obviousness against claim 1 since neither JP '322 nor US '302 teaches the steps of analyzing and ascertaining the copper content of the slag and basing the discharge of the slag on this measurement.

The Examiner bears the burden of establishing a *prima facie* case of obviousness. *In re Rijckaert*, 9 F.3d 1531, 1532, (Fed. Cir. 1993); *In re Oetiker*, 977 F.2d 1443, 1445, (Fed. Cir. 1992). Only if this burden is met does the burden of coming forward with rebuttal argument or evidence shift to the applicant. *Rijckaert*, 9 F.3d at 1532. When the references cited by the examiner fail to establish a *prima facie* case of obviousness, the rejection is improper and will be overturned. *In re Fine*, 837 F.2d 1071, 1074, (Fed. Cir. 1988).

Notwithstanding the errors in the interpretation of the prior art, the rejection is improper since the combined prior art fails to teach or suggest the step of analyzing and ascertaining the copper content of the slag and then discharging the slag based on this ascertainment.

In the rejection of claim 1, the Examiner admits that the analyzing and ascertaining step and the discharging step are not taught in US '305. The Examiner is relying on each of US '302 and JP '322 to allege that these steps are taught and that it would be obvious to modify US '305 accordingly.

The error in the rejection is that neither US '302 nor JP '322 teach the claimed analyzing and discharging steps, i.e., linking the analyzing and ascertaining step to the discharge of the slag.

What the Examiner is doing is citing US '302 and JP '322 to show that analyzing and ascertaining of slag composition is known and then baldly concluding that this analysis can be employed to control the discharge of the slag. The error is that the prior art does not suggest that the analysis can be used to control the discharge of the slag from the furnace for the purpose of optimizing PGM recovery. The Examiner is drawing a conclusion of obviousness without any factual basis to support it.

Appellant is not disputing the fact that the analysis of a slag could be performed in both US '302 and JP '322. However, Appellant is not merely claiming the analysis of a slag while in a furnace. Claim 1 requires that the **slag is discharged** when the copper content is less than 3.0%. This control is not some arbitrary number but one based on the efforts of the inventors as illustrated in Figure 2 of the application. The benefits of the inventive process have been explained above and these benefits are nowhere to be found in the prior art of JP '322 and US '302.

a. JP '322 does not teach linking the slag discharge to copper content in the slag.

In the Advisory Action of September 24, 2008 the Examiner states

JP '322 teaches the relationship between copper content of the molten slag and the recovery rate of Pt (table 1-2 of JP '322).

The Examiner's interpretation of the teachings of JP '322 in this regard is fundamentally in error and JP '322 cannot be used as a basis to support the allegation of obviousness.

Tables 1 and 2 of JP '322 do not teach a slag produced at reducing conditions in an electric furnace. A fundamental step of claim 1 is the charging step, wherein a copper source material containing copper oxide, a reductant, a flux, and a PGM-containing substance are charged into a closed furnace. Further steps include sinking the molten metal of primarily copper and enriching the PGM elements into the sunk molten metal.

JP '322 teaches a process wherein copper oxide is produced in an oxidizing furnace 1 with oxygen blowing into a molten Cu via a lance 2. The data of Tables 1 and 2, strictly speaking, show the recovery rate of PGMs when a molten copper is oxidized to a molten copper oxide by oxygen blowing in an oxidizing furnace. In making this argument to the Examiner, an enlarged copy of Figure 1 and Tables 1 and 2 of JP '322 was submitted with Appellant's October 8, 2008 response, with annotations regarding the various material flows and English translations of certain terms. The attachments were not objected to when filed with the October 8, 2008 response and are in the record. Therefore, they are included in the Evidence Appendix on page 41 of this Appeal Brief.

As can be seen from Figure 1, spent catalyst (B), molten Cu (A) and oxygen gas are supplied to the oxidizing furnace. Two output streams emanate from the furnace,

molten oxide layer, i.e., copper oxide (D), and molten metal, copper and PGMs (C). Stream C is then cast.

The molten oxide stream D is charged to an electric furnace that also receives a flux and a reducing agent. Two streams emanate from the electric furnace, a slag (F), and molten Cu (E). The molten copper stream E, which contains PGMs, is recycled to the oxidizing furnace in place of stream A in an alternate embodiment discussed in more detail below.

JP '322 describes two examples.

With respect to the examples of JP '322, Example 1 is the case where a PGM-containing substance of spent vehicle exhaust gas purification catalyst (referred to as "spent catalyst") is added to the molten copper-containing oxidizing furnace that receives a charge of molten copper.

Example 2 is similar to Example 1 except that the charge of molten copper is derived from the electric furnace 3 and has PGMs in it. The results of Example 1 are shown in Table 1 and the results of Example 2 are shown in Table 2.

In Example 1, the spent catalyst (B) is added to the molten Cu in oxidizing furnace 1 and blown with oxygen gas through the lance 2. This produces a molten oxide layer (mainly molten copper oxide) and a residual molten Cu layer in which PGMs are enriched. Referring now to Table 1, the various streams associated with Example 1 are identified by letters. A is the molten Cu charged into the oxidizing furnace 1. B is the spent catalyst, C is the molten metal discharged from the furnace 1, and D is the molten oxide layer mainly comprising Cu oxide discharged from the furnace 1.

In the rejection of November 28, 2007, the Examiner cites JP '322 as teaching that copper content in the molten slag is a result-effective variable. To support this, the Examiner refers to Table 1 of JP '322 and notes that 194 ppm Pt exists in stream C along with 200.8 kg of Cu. The Examiner then notes the amount of Pt in stream D and the 97.5 % recovery of PGMs in stream C as compared to stream D.

The problem with this approach is that the Examiner has treated stream D as a slag. In fact, stream D is not a slag, but has 82.5% Cu, which has nothing to do with a slag that is discharged when the copper content is 3.0% or less as required by the independent claims.

From this, it is clear that Table 1 does not teach that the copper content in the slag is a result-effective variable since Example 1 of JP '322 does not even speak of a slag as part of the oxidizing furnace operation. What Example 1 and Table 1 show is that PGMs are recovered in the molten Cu (Stream C) during the oxidizing process. This can be seen from Table 1 since the levels of Pt, Pd, and Rh are high. The oxidized molten Cu (Stream D) has minimal PGMs as is also evident from Table 1, wherein the Pt, Pd, and Rh levels are 1 ppm, <1 ppm, and <1 ppm, respectively. Again, this is not anywhere near the same as the claimed process, which involves a reduction of copper oxides for the enrichment of PGMs in the molten Cu and control of the discharge of the slag to improve the enrichment process.

Example 2 of JP '322 also fails to support the Examiner's position. In this Example, molten Cu accompanied by PGMs is used as the molten Cu feed material and charged into the oxidizing furnace together with the spent catalyst and blown oxygen.

Example 2 also produces a molten oxide layer (mainly copper oxide) and a residual molten Cu layer in which PGMs are enriched. The molten Cu accompanied by PGMs is obtained from electric furnace 3 shown in the lower portion of Figure 1.

In electric furnace 3, chilled copper oxide obtained from the oxidizing furnace (stream D) is charged together with flux and coke thereby to melt down and reduce the copper oxide. Slag as stream F and molten Cu accompanied by PGMs (stream E) are generated, with stream E being directed to the oxidizing furnace as part of the Example 2 investigation.

Referring now to Table 2, the difference between Table 1 and Table 2 is that in Table 1, stream A is used, which is a molten Cu material that is not enriched with PGMs as is stream E. In Table 2, stream E is used as the feed for the oxidizing furnace. Table 2 shows that there are PGMs in stream E, whereas stream A of Table 1 has no PGMs. Table 2 then compares streams C and D, with the bulk of the PGMs in stream C. Stream D contains 81.5% Cu and little of the PGMs.

Neither Table 1 nor Table 2 defines the Cu content of the slag of the electric furnace so that there is no recognized relationship between copper content and the slag in terms of a result-effective variable. Only streams A, B, C, and D are shown in Table 1 and streams E, B, C, and D are shown in Table 2.

Moreover, the Examiner cannot say that monitoring the copper content of the metal and copper oxide (streams C and D) produced in the oxidizing process of JP '322 can be used to support the contention that the ascertaining and discharging steps of claim 1 is obvious. The oxidizing process is not in the least similar to the reducing process of claim 1. If anything, the reducing process of JP '322 using electric furnace 3,

wherein a slag and a PGM-enriched molten Cu stream are produced, is more akin to the claimed process. Even with this similarity, there is no recognition in JP '322 of a control of the discharge of the slag based on copper content or how to decide the time to discharge the slag from the electric furnace. None of the data of JP '322 is from the materials IN THE FURNACE during the furnace operation wherein the concentration of the copper is varying every moment.

In its Example 2, JP '322 provides no explanation on the slag discharge from electric furnace 3 in Fig. 1, much less on the timing of when to discharge the slag from the furnace.

It is the same with it Example 1. Table 1 of JP '322 shows the data of the materials for charging to the oxidizing furnace and discharging from the furnace. In Table 1 of JP '322, there is no data of the slag discharged from the electric furnace 3. Also, in JP '322 and Example 1, there is no explanation of the timing of discharging the materials from the oxidizing furnace 1 or the timing of the discharge of the slag from electric furnace 3.

From this, it is apparent that JP '322 does not teach the ascertaining and analyzing step of the copper content of the slag in the furnace and discharge of slag based on the ascertaining step as required by claim 1, wherein the furnace is for melting, together with flux components and a reducing agent, platinum-group element-containing substances.

To reiterate, claim 1 requires the steps of:

- ascertaining a copper content of molten slag in the furnace by sampling and analyzing; and
- discharging molten slag from the electric furnace when a copper content of the molten slag determined by said ascertaining step is 3.0 wt.% or less.

These steps are not at all taught in JP '322 with respect to the furnace 1 or the electric furnace 3. The electric furnace of the invention is not for oxidizing molten metal as is the function of the furnace 1 of JP '322. Moreover, JP '322 does not teach nor suggest using the copper content of the slag in the electric furnace 3 as the parameter to decide the time to discharge the slag from the furnace.

To recap, the Examiner does not have a factual basis to assert that JP '322 teaches one of skill in the art to monitor the slag of the furnace of US '305 and discharge the slag based on when the monitored slag content is less than 3% copper. Lacking a factual basis in JP '322 to teach the missing feature of US '305, a *prima facie* case of obviousness is not established and the rejection must be reversed.

b. US '302 does not teach linking the time of the slag discharge to copper content in the slag.

US '302 also fails to teach the steps at issue here, i.e., ascertaining and analyzing the copper content of the slag in the furnace and basing the discharge of the slag from the furnace based on the copper content being 3.0% or less as determined by the ascertaining and analyzing step.

More specifically, the data of "First-stage slag" in the Table on col. 20, lines 46-47, of US '302 shows that the data has been obtained by analyzing the slag AFTER DISCHARGE FROM A CRUCIBLE TEST in a laboratory-scale furnace in the first stage. It is apparent to one of skill in the art that the explanation set out below from col. 20, lines 24-35 does not mean that the data of the first-stage slag is one in the furnace at work and PRIOR TO DISCHARGE FROM THE FURNACE.

Col. 20, lines 24-35 reads as follows:

A crucible test in a laboratory-scale furnace was performed using a feed comprising 1050 g of dead-roasted furnace matter (derived from 1098 g of unroasted furnace matte), 450 g of silica, and 31.5 g of carbon. This produced 1517 g of slag and 38 g of copper-nickel alloy containing the vast majority of the precious metals.

From this, it is clear that the copper content of 5.5 wt.% and nickel content of 11.7% in the first stage slag shown in the Table are values which have been obtained by analyzing a sample picked up from the 1517 g of produced slag that has been discharged from the furnace and weighed. The copper content in this produced slag is of no usage any more to decide the timing of when the slag should be discharged. In the experiment of US '302, the first stage slag ought to be discharged when the experimenter would have judged that the smelting has been sufficiently conducted in the first stage conditions. If the data relating to the slag amount would have referred to the slag in the crucible itself, US '302 would not have stated "This produced 1517 g of slag." Moreover, if the data related to the slag during the smelting operation, US '302 would likely have shown data of several measurements during the smelting process, not one set of data as is the case.

Appellant asserts that the Examiner has improperly interpreted the teachings of US '302 to allege that an ascertaining and analyzing step of the slag IN THE FURNACE could be employed in the process of US '305. In fact, US '302 does not teach such a step and the Examiner has committed error in the improper interpretation of the teachings of US '302. Again, US '302 does not teach the ascertaining step of claim 1 since this step is required to be conducted on the slag IN THE FURNACE, and the information gleaned from this step as it relates to the copper content determines the discharge of slag from the furnace. Since US '302 does not teach these steps, even if it

were combined with US '305, a *prima facie* case of obviousness would not exist against claim 1.

In the Advisory Action, the Examiner responds to the arguments above by saying that the composition of the slag can be ascertained off site and that the claims do not require an in-situ slag analysis. The Examiner misses the point of Appellant's argument. The point of the argument is not how or where the slag is analyzed. The point is that the slag is **in the furnace** and is analyzed in that state so that the decision about discharge can be made. The analysis of the slag in cols. 16 and 17 of US '302 is not done as a precursor to the slag discharge, it is just done.

The above demonstrates that US '302 also fails to supply an objective basis to modify the process of US '305 and ascertain the slag content prior to discharge and discharge the slag based on a copper content in the slag of less than 3%. This means that a *prima facie* case of obviousness is not established based on the combination of US '302 and US '305 and the rejection must be reversed.

C. The cited prior art does not teach the use of granules as required in claims 1 and 4 and the use of granules provides unexpected improvements.

In the rejection of claims 1 and 4, the Examiner relies on US '305 to allege that claimed copper source material is disclosed. More specifically, the Examiner alleges that since US '305 teaches a source material size of not more than 5 mm, that the range of 0.1 to 10 mm is obvious. In US '305, it is taught to use a copper oxide **powder** as the copper source material, see col. 4, line 34. As the Examiner knows,

powders and granules are not the same. The inventors of the instant application, who are partially in common with the inventors of US '305 discovered that it is better to charge copper oxide **granules** of the claimed size since this produces improvements in the copper showering effect, whereas such improvements do not occur when using a copper oxide powder. Moreover, the inventors discovered that the preferred form of granules and claimed size range can be obtained when practicing the method of claim 4 with respect to formation of the copper source material.

The use of granules as defined in claims 1 and 4 is not disclosed in the cited prior art and particularly US '305. Therefore, a *prima facie* case of obviousness does not exist with respect to the claims. Moreover, there is no teaching or suggestion to instruct the artisan to employ granules as claimed in the process of US '305. Without any factual basis to make this conclusion, any rejection of this nature would only be based on hindsight.

In the Advisory Action of December 3, 2009, the Examiner alleged that there was no evidence to demonstrate the importance of the granule size. Appellant submits that the Examiner has committed error in ignoring the evidence of record showing the importance of the claim limitation regarding the granule size. The Board's attention is directed to paragraph [0036]. Here, the copper showering effect is produced most efficiently when employing the claimed size range. Attention is also directed to comparative Examples 2 and 3 in paragraphs [0049 and 0050]. In Comparative Example 2, wherein the grain diameter is less than 0.1 mm, the amounts of PGM in the slag were significantly higher than Example 1, which varied only with respect to the

granule size. Comparative example 3 includes granules that exceed the upper limit of 10 mm and the recovery of PGM was also poor as compared to inventive Example 1.

US '305 says nothing about the showering effect or the importance of control of the copper source material size. The improvement associated with this effect as a result of the control of the size of the source material is one that is unexpected and a rebuttal of the allegation that the claimed range is merely an obvious variation based on the suggestion of US '305. The Examiner must take into account the comparison in the specification and it is error for the Examiner to ignore this evidence when weighing patentability. Moreover, when considering the evidence, the limitation regarding granule size is a further patentable distinction over the applied prior art and the rejection applied to claims 1 and 4 in this regard should be reversed. At the least, the application should be remanded for consideration of the comparison in the specification regarding the importance of the granule sizes found in the claims.

D. The rejection of claim 3 is in error since the proper reasoning does not exist to support the rejection.

In addressing claim 3, the Examiner admits that the reduced pressure operation specified by claim 3 is not disclosed in any of US '305, JP '322, or US '302. To address this deficiency, the Examiner cites US '933 to allege that US '933 teaches a method of processing copper-containing waste in a vacuum heating furnace. The Examiner alleges that the process of US '933 is similar to the process of the claims and therefore it would be obvious to use the vacuum technique of US '933 in the process of US '305.

The reason for the modification is that US '933 teaches that the vacuum heating process can be applied to all types of waste materials to allow recovery of highly pure individual components.

This reasoning is improper since the teachings of US '933 that relate to all waste materials do not mean that one can merely use the vacuum of US '933 in all other processes. What US '933 teaches is that any type of waste material can be employed in this patent's particular vacuum process. This is clear from col. 1, lines 5-15, wherein US '933 identifies a number of different types of waste materials, e.g., appliances, dust, slag, sludge, batteries. The US '933 touts the advantage of the processing of such waste material as a simple treatment process, see col. 1, line 29.

US '933 also identifies a number of prior art processes for treating waste and their respective problems, see col. 1, lines 38 to col. 2, line 43. US '933 solves these problems through the use of its unique vacuum treatment method, wherein the waste materials are heated in a sealed heating furnace under vacuum. The furnace temperature is raised in stages and the metal components are volatilized and recovered based on their different melting points.

The Examiner has committed error by interpreting US '933 to teach that any waste material recovery process, e.g., a process for recovering PGMs, can be modified by using a vacuum. This is a distortion of the teachings of US '933. US '933 nowhere states such a proposition. What US '933 does teach is that instead of using the smelting operation of US '305, one could take the PGM-containing materials and treat

them in the vacuum process of US '933. However, recovering PGMs using the process of US '933 is irrelevant to the claimed process.

The Examiner has committed error by misinterpreting the teachings of US '933 and using this misinterpretation to reject claim 3. Thus, the rejection of claim 3 should be reversed.

Moreover, US '933 is a volatilization process, whereas US '305 is a melting process. The two are not even remotely similar and one of skill in the art would not pluck one variable of the volatilization process of US '933, i.e., a vacuum, and use it in the melting process of US '305. This is hindsight on the part of the Examiner. To employ the vacuum and volatilization of US '933 in US '305 would require a wholesale change to the process of US '305 and there is just no reason for making such a change. One of skill in the art could merely use the process of US '933 as an alternative to that used in US '305; not seek to somehow merge the two as is proposed in the rejection. Appellant submits that the Examiner has erred by drawing a conclusion of obvious without the articulated reasoning required by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 177 L. Ed. 2d 705 (April 30, 2007). Notwithstanding the decision in *KSR*, the following legal principles are still valid, having been endorsed by the Supreme Court or having been unaffected by its decision: (1) the USPTO still has the burden of proof on the issue of obviousness; (2) the USPTO must base its decision upon evidence, and it must support its decision with articulated reasoning, *id.* at 722; (3) merely demonstrating that all elements of the claimed invention exist in the prior art is not

sufficient to support a determination of obviousness, *id.* at 722; and (4) hindsight has no place in an obviousness analysis, *id.* at 724).

The rejection using US '933 violates the requirement in KSR that the Examiner have a reason to modify US '305. No reason exists and the rejection must be reversed for this reason.

Further, the use of the reduced pressure atmosphere produces unexpected improvements in the process. As detailed on page 11, the last seven lines, to maintain the interior of the furnace at a pressure lower than atmospheric pressure has brought more excellent copper showering. This is further substantiation of the patentability of the features of claim 3.

E. The features of claim 4 are not found in the prior art and a prima facie case of obviousness has not been established against this claim.

In the rejection, the Examiner relies on US '305 to teach the feature of claim 4 with respect to producing the copper source material for the waste recovery.

Besides containing the claim limitations regarding the ascertaining and analyzing of the slag and granule size, claim 4 requires that the molten metal discharged from the furnace is transferred to a separate furnace in order to further enrich PGMs in the molten metal. This processing has the specified feature of producing the copper source material having the claimed average grain diameter. More particularly, the claim recites "the molten slag generated in the separate furnace is water cooled from a high temperature state to obtain a copper source material containing the aforesaid copper

oxide composed of granules having a grain diameter of not less than 0.1 mm and not greater than 10 mm.”

The Examiner cites col. 3, lines 58-61 of US '305 to allege that this sequence of steps is taught. This part of US '305 states “The layer of the copper oxide flown out and separated may be, after solidified for cooling and isolated, reused in the first process for elevating the recovery ratio of the platinum group metal.”

In the rejection, the Examiner baldly concludes that “solidified for cooling and isolating” is general enough to include water cooling method. Appellant submits that the Examiner has committed error in rejecting claim 4 by speculating to make the rejection and failing to support the conclusion of obviousness with a factual basis. The cooling could be just pouring the copper oxide into a receptacle, allowing it to cool naturally and then reducing it in size for reuse. It is error for the Examiner to assume that the limitations of the claims are found in US '305 when the specifics of the claim are not disclosed or implied. The Examiner is drawing a conclusion of obviousness without the requisite factual basis and this approach taints the rejection to the point that it must be reversed.

The Examiner also refers to claim 19 of US '302 to teach a method of making particles. Claim 19 refers to a copper nickel alloy, that once made, can be water atomized into particles. The question is why or how does this teaching lead one of skill in the art to water atomize the copper oxide of US '305. The copper nickel alloy of US '302 is not a recycle stream nor is it a raw material to be used as a source material.

The Examiner again draws a conclusion of obviousness without a factual basis. This is error and requires the reversal of the rejection of claim 4.

The rejection of claim 4 is also improper since the limitations regarding the granule size and the ascertaining and discharging steps are not taught by the cited prior art. The reasons to support this argument are the same as those made above in Section VII.B. concerning the ascertaining and discharging steps and Section VII.C. concerning the granule size limitation. This means that a *prima facie* case of obviousness is also not established against claim 4 for these reasons.

VIII. CONCLUSION

As the Supreme Court has said in *KSR International Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007), rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning of facts to support the legal conclusion of obviousness. *Id.* at 1741. The Examiner is misinterpreting the factual teachings of US '302 and JP '322 to allege that claims 1 and 4 are obvious. The rejection is also in error since the secondary references to US '302 and JP '322 do not supply the missing features of claims 1 and 4 in US '305.

The Examiner has also committed error by failing to fully address the evidence relating to the granule size limitations and failing to consider this evidence when weighing the patentability of claims 1 and 4 requires at least a remand of the rejection.

The Examiner has also erred in failing to provide the required articulated reasoning to support the rejections of claims 3 and 4. Therefore, the Examiner has failed to establish a *prima facie* case of obviousness against claims 1, 3, and 4 and these claims are patentable over the prior art.

The final rejection being in error, therefore, Appellant respectfully requests that the Honorable Board of Patent Appeals and Interferences reverse the Office Action's decision in the present application regarding the rejection of claims 1, 3, and 4 and indicate that these claims are now allowable.

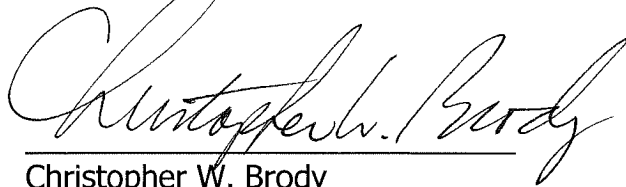
Application No.: 10/521,818

Appellant submits that this Appeal Brief is being timely filed and meets the requirements set forth under 35 U.S.C. § 134 and in 37 C.F.R. § 41.37.

Please charge Deposit Account No. 50-1088 the fee of \$540.00 for the Appeal filing fee.

A petition for a one month extension of time is made. Please charge Deposit Account No. 50-1088 the fee of \$130.00. Please charge any fee deficiency and credit any excess to Deposit Account 50-1088.

Respectfully submitted,
CLARK & BRODY

A handwritten signature in cursive script, appearing to read "Christopher W. Brody", written over a horizontal line.

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Date: April 20, 2010

CLAIMS APPENDIX

1. A method for recovering platinum group elements comprising:

charging into a closed electric furnace and melting, together with flux components and a reducing agent, a platinum group element-containing substance including spent petrochemical type catalyst or spent vehicle exhaust gas purification catalyst to be processed and a copper source material containing copper oxide;

sinking molten metal of primarily metallic copper below a molten slag layer of primarily oxides; and

enriching the platinum group elements in the molten metal sunk below,

which method for recovering platinum group elements is characterized in that the copper source material charged into the electric furnace is composed of granules of an average grain diameter of not less than 0.1 mm and not greater than 10 mm and by the steps of:

ascertaining a copper content of molten slag in the furnace by sampling and analyzing; and

discharging molten slag from the electric furnace when a copper content of the molten slag determined by said ascertaining step is 3.0 wt.% or less.

2. canceled

3. A method for recovering platinum group elements according to claim 1, wherein the interior of the electric furnace is maintained at a pressure lower than atmospheric pressure from the melting of the charge material to the discharging of the molten slag.

4. A dry method for recovering platinum group elements comprising:

charging into a closed electric furnace and melting, together with flux components and a reducing agent, a platinum group element-containing substance to be processed and a copper source material containing copper oxide;

sinking molten metal of primarily metallic copper below a molten slag layer of primarily oxides;

enriching the platinum group elements in the molten metal sunk below;

separating the molten metal enriched in the platinum group elements from the molten slag and transferring it to a separate furnace while still in the molten state;

oxidizing the molten metal in the separate furnace to separate it into a slag layer of primarily oxides and a molten metal layer further enriched in the platinum group elements,

which method for recovering platinum group elements is characterized in that the copper source material charged into the electric furnace is composed of granules of an average grain diameter of not less than 0.1 mm and not greater than 10 mm; and by the steps of:

ascertaining a copper content of molten slag in the furnace by sampling and analyzing; and

discharging molten slag from the electric furnace when a copper content of the molten slag determined by said ascertaining step is 3.0 wt.% or less; and

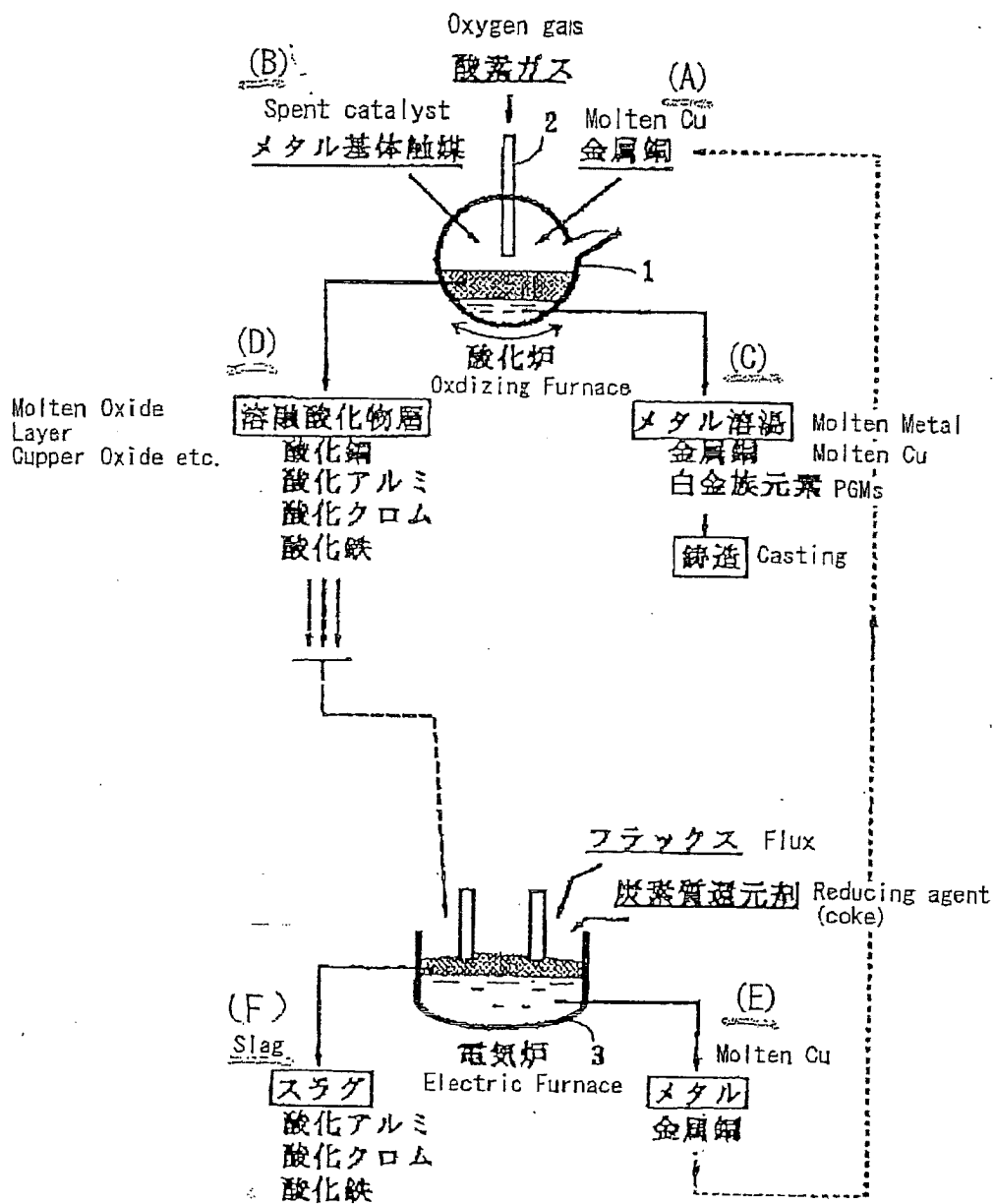
the molten slag generated in the separate furnace is water-cooled from a high-temperature state to obtain a copper source material containing the aforesaid copper oxide composed of granules having a grain diameter of not less than 0.1 mm and not greater than 10 mm.

5-7. canceled

EVIDENCE APPENDIX

Submitted herewith are three pages of an Attachment, which was submitted with the response filed on October 8, 2008. This attachment was submitted to demonstrate that the Examiner's interpretation that JP '322 taught a relationship between the copper content of the molten slag and the recovery rate of Pt is in error.

【図 1】



【表1】

	重量 Kg	C u		P t		P d		R h	
		含有量 %	重量 Kg	含有量 ppm	重量 g	含有量 ppm	重量 g	含有量 ppm	重量 g
装入物									
金属銅(A)	1002	100	1002	0	0	0	0	0	0
メタル基触媒(B)	50	0	0	800	40.0	100	5.0	300	15.0
メタル溶湯(C)	201	99.9	200.8	194	39.0	25	5.0	75	15.1
溶融酸化物(D)	970	82.5	800.2	1	1.0	<1	0	<1	0
白金族元素回収率(%)		—		97.5		100.0		100.0	

Recovery rate of PGMs

A B C D

【表2】

	重量 Kg	Cu 重量 含有量 %		Pt 重量 含有量 ppm		Pd 重量 含有量 ppm		Rh 重量 含有量 ppm	
		Kg		g		g		g	
装	電気炉還元銅(E)	790	99	782	1	0.8	0	0	0
入	メタル基触媒(B)	50	0	0	800	40.0	100	300	15.0
物	合計	840		782		40.8			15.0
処	メタル溶湯(C)	195	99.9	195	205	40.0	26	77	15.0
理	溶融酸化物(D)	718	81.5	585	1	1.0	<1	<1	0
物	合計			780		41.0			15.0

E B

C D

RELATED PROCEEDINGS APPENDIX

None.